# Russian EVA examines hole repair area on Soyuz MS-09

written by Chris Bergin | December 11, 2018


A unique spacewalk was conducted on Tuesday, as two Russian cosmonauts examined a hole that was found in the orbital module of the Soyuz MS-09 spacecraft. Oleg Kononenko and Sergey Prokopyev were tasked with cutting through the insulation of the Soyuz spacecraft to take photos and collect samples, ahead of its upcoming return to Earth later this month.

The spacewalk – named “VKD-45A” – involved Kononenko donning the Orlan MKS #5 (red stripes) as EV1 and Prokopyev in the Orlan MKS #4 suit (blue stripes) as EV2.

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Although the leak was minor – to the point Station controllers didn't warrant waking the crew – its location was unusual and provided additional concerns based the potential impact to one of the vehicles required to transport three crewmembers back home. The docked Soyuz vehicles also serve as the lifeboats for what is usually a six person ISS crew.

With the leak located behind the toilet area in the orbital module, a plan was devised to patch the hole to at least stop the leak. This first involved astronaut Alexander Gerst placing his thumb over the hole, before Russian crewmembers evaluated a more permanent fix.

There was some initial disagreement among the crew (as well as between NASA and Roscosmos) in terms of implementing the permanent fix so quickly, with ISS Commander Drew Feustel (NASA) wanting to hold off on the permanent fix until the ground controllers could review the idea, while Roscosmos wanted to proceed with the sealant/patch/tape fix immediately. The commander made his feelings known over the public flight loop, before conceding to the Russian position.

*Image of the repair work – via NASA*

However, the application of tape, patches and sealant appeared to work, with no further leak indications observed. While that solved the immediate issue, an investigation into the cause of the hole has failed to come to a firm conclusion.

It was first assumed that the hole was caused by a MMOD strike, which is a constant threat for the orbital outpost.

While the Station is built to withstand most MMOD (MicroMeteoroid and Orbital Debris) impacts, at least to the point it would not cause a major issue such as depressurization event, the MMOD shielding on the Soyuz is less impressive, not least when these vehicles are only expected to serve six months in space, as opposed to the decades the ISS modules have in their lifespan.

Doubts about the MMOD strike theory were noted when photos of the hole – first published on a NASA update video, before being edited out and the video reuploaded – made it obvious the hole looked man-made and alien to that of a usual MMOD impact site. Based on the photographs, it looked likely the hole was caused by a drill with the drill bit also marking the surrounding area.

*The hole before it was repaired – via NASA (before being deleted, but saved by social media followers).*

After some of the traditionally dramatic reports in the mainstream Russian media, some pointing to potential sabotage, the most likely theory of an error during the production of the Soyuz on the ground was deemed to be the most likely root cause. Russian quality assurance issues have plagued the industry for many years.

However, despite a State Commission investigation, no definitive explanation has been forthcoming. The only collaborating comments have been claims the hole was indeed created by a drill, but strangely accompanied by claims it wasn't known if the drill hole was caused by a deliberate or accidental action.

The EVA was tasked to at least shed more light on the damaged area and potentially aid confidence the vehicle will be safe for returning its three person crew.  Prokopyev, NASA astronaut Serena Auñón-Chancellor, and Gerst are scheduled to depart the station in the Soyuz MS-09 on December 19.

*Soyuz MS-09 when it arrived at the ISS – via Roscosmos*

The EVA examined a section of the external hull of the Soyuz MS-09 spacecraft, took samples of residue found on the hull, along with digital images of the area before the plan called for the placing a new thermal blanket over it.

The samples and images will provide additional information that will aid the investigation into the cause of the pressure leak.

In preparation for this spacewalk, engineers at RSC Energia have been working with the tools that will be employed during the EVA, namely a “space dagger”, “space scissors” and an “oversized space shear cutter”.

The spacewalkers literally cut into the Soyuz’s black thermal blankets and pulled away the insulation to expose the area around the hole.

This task, which came after a delay of around an hour due to issues with the Strela crane and foot restraint used to translate the spacewalkers to the work site, was dramatic to say the least.

Prokopyev was heard joking in saying he couldn't watch as it was "his spacecraft" his comrade was cutting into.

While the work was not expected to cause the sealant that has since sealed the hole to become dislodged, the spacewalkers had to be careful not to cause more damage to the Hull, or themselves, as sharp tools started to fly around the area of their gloves.

Due to time constraints, the plan to add a thermal patch over the repair area was aborted.

The cosmonauts were also set to retrieve science experiments from Rassvet before heading back inside. However,

due to being behind the timeline, this option was not taken.

Regardless of the outcome of the EVA, the Soyuz is still expected to be used for the return trip home. The scenario for undocking is to have the crew to remain in the descent module and sealed from the orbital module via the hatches.

Only the descent module is used during the final part of the crew's return, with the other two modules discarded ahead of entry interface.

EVA ISS MMOD SOYUZ

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